



GM2A gene

GM2 ganglioside activator

Normal Function

The *GM2A* gene provides instructions for making a protein called the GM2 ganglioside activator. This protein is necessary for the normal function of an enzyme called beta-hexosaminidase A, which plays a critical role in the brain and spinal cord (central nervous system). Beta-hexosaminidase A and the GM2 ganglioside activator protein work together in lysosomes, which are structures in cells that break down toxic substances and act as recycling centers. Within lysosomes, the activator protein binds to a fatty substance called GM2 ganglioside and presents it to beta-hexosaminidase A to be broken down.

Health Conditions Related to Genetic Changes

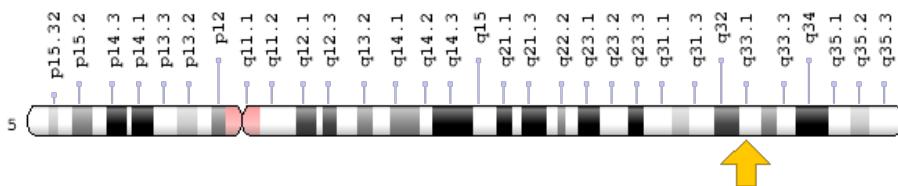
GM2-gangliosidosis, AB variant

Only a few mutations in the *GM2A* gene have been identified in people with GM2-gangliosidosis, AB variant. Some of these mutations change single protein building blocks (amino acids) in the GM2 ganglioside activator. Other mutations delete a small amount of DNA from the *GM2A* gene. These genetic changes result in an unstable activator protein that is quickly degraded, or they prevent the gene from making any functional protein. Without the GM2 ganglioside activator, beta-hexosaminidase A is unable to break down GM2 ganglioside. As a result, this substance builds up to toxic levels, particularly in nerve cells in the brain and spinal cord. Progressive damage caused by the buildup of GM2 ganglioside leads to the destruction of these cells, which causes the signs and symptoms of the AB variant.

Chromosomal Location

Cytogenetic Location: 5q33.1, which is the long (q) arm of chromosome 5 at position 33.1

Molecular Location: base pairs 151,253,052 to 151,270,394 on chromosome 5 (Homo sapiens Annotation Release 108, GRCh38.p7) (NCBI)



Credit: Genome Decoration Page/NCBI

Other Names for This Gene

- cerebroside sulfate activator protein
- GM2 activator
- GM2 ganglioside activator protein
- SAP-3
- SAP3_HUMAN
- sphingolipid activator protein 3

Additional Information & Resources

Educational Resources

- Essentials of Glycobiology (1999): GM2 Activator
<https://www.ncbi.nlm.nih.gov/books/NBK20729/#A1387>

Scientific Articles on PubMed

- PubMed
<https://www.ncbi.nlm.nih.gov/pubmed?term=%28GM2A%5BTIAB%5D%29+OR+%28GM2+ganglioside+activator%5BTIAB%5D%29%29+OR+%28cerebroside+sulfate+activator+protein%5BTIAB%5D%29+OR+%28GM2+activator%5BTIAB%5D%29+OR+%28SAP-3%5BTIAB%5D%29%29+AND+%28Genes%5BMH%5D%29+OR+%28Genetic+Phenomena%5BMH%5D%29%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+3600+days%22%5Bdp%5D>

OMIM

- GM2 ACTIVATOR
<http://omim.org/entry/613109>

Research Resources

- ClinVar
<https://www.ncbi.nlm.nih.gov/clinvar?term=GM2A%5Bgene%5D>
- HGNC Gene Symbol Report
http://www.genenames.org/cgi-bin/gene_symbol_report?q=data/hgnc_data.php&hgnc_id=4367
- NCBI Gene
<https://www.ncbi.nlm.nih.gov/gene/2760>
- UniProt
<http://www.uniprot.org/uniprot/P17900>

Sources for This Summary

- Chen B, Rigat B, Curry C, Mahuran DJ. Structure of the GM2A gene: identification of an exon 2 nonsense mutation and a naturally occurring transcript with an in-frame deletion of exon 2. *Am J Hum Genet.* 1999 Jul;65(1):77-87.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/10364519>
Free article on PubMed Central: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1378077/>
- Mahuran DJ. Biochemical consequences of mutations causing the GM2 gangliosidoses. *Biochim Biophys Acta.* 1999 Oct 8;1455(2-3):105-38. Review.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/10571007>
- Mahuran DJ. The GM2 activator protein, its roles as a co-factor in GM2 hydrolysis and as a general glycolipid transport protein. *Biochim Biophys Acta.* 1998 Jul 31;1393(1):1-18. Review.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/9714704>
- Schepers U, Glombitza G, Lemm T, Hoffmann A, Chabas A, Ozand P, Sandhoff K. Molecular analysis of a GM2-activator deficiency in two patients with GM2-gangliosidosis AB variant. *Am J Hum Genet.* 1996 Nov;59(5):1048-56.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/8900233>
Free article on PubMed Central: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1914821/>
- Wendeler M, Werth N, Maier T, Schwarzmann G, Kolter T, Schoeniger M, Hoffmann D, Lemm T, Saenger W, Sandhoff K. The enzyme-binding region of human GM2-activator protein. *FEBS J.* 2006 Mar;273(5):982-91.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/16478472>

Reprinted from Genetics Home Reference:

<https://ghr.nlm.nih.gov/gene/GM2A>

Reviewed: September 2008

Published: March 21, 2017

Lister Hill National Center for Biomedical Communications
U.S. National Library of Medicine
National Institutes of Health
Department of Health & Human Services